Supplement I: Annotated Bibliography of the Horn Fly, *Haematobia irritans irritans* (L.) Including References on the Buffalo Fly, *H. irritans exigua* (de Meijere), and Other Species Belonging to the Genus *Haematobia*

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UNITED STATES DEPARTMENT OF AGRICULTURE

This publication reports research involving pesticides. It does not contain recommendations for their use, nor does it imply that the uses discussed here have been registered. All uses of pesticides must be registered by appropriate State and/or Federal agencies before they can be recommended.

CAUTION: Pesticides can be injurious to humans, domestic animals, beneficial insects, desirable plants, and fish or other wildlife—if they are not handled or applied properly. Use all pesticides selectively and carefully. Follow recommended practices for the disposal of surplus pesticides and pesticide containers.

SPECIES CITED IN REFERENCES

Haematobia Lepeletier & Serville (1828)
Lyperosia Rondani (1856)
Priophora Robineau-Desvoidy (1863)
Glossinella Grunberg (1906)
Haphospatha Enderlein (1924)
Siphona auct. (nec Meigen)
irritans irritans (Linnaeus, 1758)
pungens (Fabricius, 1794)
serrata Robineau-Desvoidy (1830)
tibialis Robineau-Desvoidy (1830)
cornicola Williston (1889)
meridionalis (Bezzi, 1911)
rufifrons (Bezzi, 1911)
weissi (Bezzi, 1911)
irritans exigua de Meijere (1903)
flavohirta (Brunetti, 1910)
australis Malloch (1932)
spinigera Malloch (1932)
schillingsi (Grunberg, 1906)
minuta (Bezzi, 1892)
longipalpis (Roubaud, 1906)
potrix (Enderlein, 1928)
meridiana Zumpt (1973)
thirouxi thirouxi (Roubaud, 1906)
hirudo (Enderlein, 1924)
minuta (Enderlein, 1928, nec Bezzi)
thirouxi potans (Bezzi, 1907)
pallidipes (Roubaud, 1907)
thirouxi titillans (Bezzi, 1907)
irritans (Rondani, 1862, nec Linnaeus)
tibialis (Hough, 1900, nec Robineau-Desvoidy)
equina (Enderlein, 1928)
latirostris (Enderlein, 1928)
bovina (Peus, 1937)
scolopax (Peus, 1937)

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Clyde E. Morgan and Gustave D. Thomas[1]

This supplement is the first to "Annotated Bibliography of the Horn Fly, *Haematobia irritans* (L.), Including References on the Buffalo Fly, *H. exigua* (de Meijere), and Other Species Belonging to the Genus *Haematobia*," published in 1974 (U.S. Dep. Agric., Misc. Publ. No. 1278).

Included in this supplement are literature citations on *Haematobia* published from 1971 through 1975 and publications prior to 1971 omitted in the previous bibliography. Literature containing original information relating to biology, systematics, distribution, and control of *Haematobia* is annotated. Literature summarizing known information of minor importance is listed.

Abbreviations used in the citations are constructed according to the rules of the "American National Standard for Abbreviation of Titles of Periodicals" and can be found in "BIOSIS 1974 List of Serials with Coden, Title Abbreviations, New, Changed, and Ceased Titles," published by Bio-Science Information Service of Biological Abstracts.

In 1973, F. Zumpt, South Africa, presented a treatise revising the Stomoxyinae of the world. We list his classification of *Haematobia* to assemble the many synonymous species in this and the previous bibliography, and to bring information on the genus up to date. Currently *Haematobia* is comprised of six species including five subspecies.

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114. Ferrar, P. 1973. The CSIRO dung beetle project. Wool Technol. Sheep Breed. 20(1): 73-75.

115. ——— 1975. Disintegration of dung pads in north Queensland before the introduction of exotic dung beetles. Aust. J. Exp. Agric. Anim. Husb. 15(74): 325-329.

116. Fincher, G. T., R. Davis, and T. B. Stewart. 1971. Flight activity of coprophagous beetles on a swine pasture. Ann. Entomol. Soc. Am. 64(4): 855-860.

117. Fordham, W. J. 1945. A preliminary list of the Diptera of Northumberland and Durham (excluding the Cecidomyidae). Trans. Nat. Hist. Soc. Northumberl. Durham Newcastle-Upon-Tyne (New Ser.) 7: 197-265.

Haematobia (=*Haematobosca*) *stimulans* was included in the Diptera list.

118. Frey, R. 1924. Diptera Brachycera. *In* Dampf, A. Zur Kenntnis der estlandischen Hochmoorfauna. Sitzungsberichte Naturforscher-Gesellschaft Universitat Dorpat 31: 55.

Haematobia (=*Haematobosca*) *stimulans* was listed.

119. Gamal-Eddin, F. M. 1968. Field studies on the biting cycle of two bloodsucking flies (*Siphona irritans* and *Musca crassirostris*) in Egypt. J. Egypt Vet. Med. Assoc. 28(1/2): 83-91.

On cattle, *H. i. irritans* has two peaks of biting activity during the different seasons—during spring and summer the afternoon peaks were slightly higher than the morning peaks; the reverse was true during late autumn and winter. On donkeys, only one peak of biting activity was noted (in the morning).

120. ——— 1971a. Field and laboratory studies on the life cycle of the blood-sucking, ectoparasitic fly *Siphona irritans,* Lin. in Egypt (Diptera: Muscidae). J. Egypt. Vet. Med. Assoc. 31(3/4): 243-250.

Oviposition lasted an average of 9.5 days at 30° C and 13 days at 25° C. At natural temperatures, the average number of eggs deposited was at its lowest (20) for the year in October and rose gradually to a maximum of 125 in May, after which it again declined. At constant temperatures of 20° and 30° C, an average of 74.3 and 142.5 eggs were deposited respectively.

121. ——— 1971b. Studies on the behavior of the blood-sucking fly *Siphona irritans* Lin. towards some environmental factors, to pave the way for proper control. A. The adult stage. (2). Reactions to temperature. J. Egypt. Vet. Med. Assoc. 31(3/4): 251-262.

Lab studies showed that in choice-chamber experiments, *H. i. irritans* exhibited a preference for temperatures between 20° and 35° C. Preconditioning had no effect on the subsequent behavior of the flies.

122. ——— 1972a. Field and laboratory studies on the life cycle of the blood-sucking ectoparasitic fly *Siphona irritans,* Lin. in Egypt. (2) The egg stage. J. Egypt. Vet. Med. Assoc. 32 (1/2): 45-53.

Duration of the egg stage varied from an average of 30 hr at 20° C to 11.2 days at 33.5° C. Eggs held below 90 percent RH did not hatch. As the temperature increased, the lower limit of humidity at which hatching occurred was reduced.

123. ——— 1972b. Field and laboratory studies on the life cycle of the blood-sucking ectoparasitic fly *Siphona irritans,* Lin. in Egypt. 3. The larval and pupal stages and their micro habitats in nature. J. Egypt. Vet. Med. Assoc. 32(1/2): 55-74.

Duration of the three larval instars varied from 13 days at 18° C to 3.8 days at 32° C; duration of the pupal stage varied from 13.5 days at 18° C to 3.9 days at 31° C. Pupal period was shorter at 98 percent RH than at 90, 95, or 100 percent RH at 25° C. Field studies included observations on temperature, RH, and pH of cow pats. In Egypt optimum developmental temperatures occurred in the spring.

124. ——— 1972c. Studies on the behavior of the blood-sucking fly *Siphona irritans,* Lin. toward some environmental factors, to pave the way for proper control. (Diptera: Muscidae) A. The adult stage. (3) Smell reaction and olfactory receptors. J. Egypt. Vet. Med. Assoc. 32 (3/4): 229-246.

Reactions of *H. i. irritans* to the smell of animals and dung were studied. Various combinations of smell, temperature, and humidity were tested. The degree of moistening of the host's body was found to determine the degree of abundance of flies on the host.

125. Gjullin, C. M., and V. D. Bevill. 1972. Insect chilling table. J. Med. Entomol. 9(3): 266.

126. Glaser, R. W. 1923. The effect of food on longevity and reproduction in flies. J. Exp. Zool. 38(3): 383-412.

H. i. irritans could be kept in captivity for 2 to 25 days but ceased egg laying 2 to 5 days after capture.

127. Gmelin, J. F. 1790. Caroli a Linne', systema naturae per Regna Tria Naturae. (ed. 13). vol. 1: Regnum Animale, pt. 5. Lipsiae (=Leipzig). p. 2892.

128. Goble, H. W. 1948. Insects attacking man and domestic animals. Can. Insect Pest Rev. 26: 56, 80, 85.

129. ——— 1950. Insects affecting man and domestic animals. Can. Insect Pest Rev. 28: 56, 92.

130. Gonzalez, R. H. 1968. *Haematobia irritans* (L.) en Chile. Rev. Chil. Entomol. 6: 142.

Collected *H. i. irritans,* not previously known in Chile.

131. Gonzalez-Rincones, R., and L. Guyon. 1953. Classificacion general de los Dipteros. Caracas, pp. 118-125.

132. Gotwald, W. H. 1965. A checklist and keys to the Muscinae and Stomoxydinae (Diptera: Muscidae) of Pennsylvania. Entomol. News 76: 199-210.

133. Graham, O. H., R. O. Drummond, and R. A. Hoffman. 1968. Possibilities of the sterile-male technique for the control of livestock insects in the United States of America. *In* Control of Livestock Insect Pests by the Sterile-Male Technique. (Panel Proc. Ser.) Int. At. Energy Agency. pp. 41-44.

134. Greenburg, B., and D. Povolny'. 1971. Bionomics of flies. *In* Greenburg, B. Flies and Disease. vol. 1. Princeton p. 65.

135. Gregor, F., and D. Povolny'. 1958. Versuch einer klassifikation der synanthropen fliegen. J. Hyg. Epidemiol. Microbiol. Immunol. (Prague) 2: 205-216.

136. ——— and D. Povolny'. 1960. Beitrag zur kenntis der synanthropen fliegen ungarns. Cas. Cesk. Spolecnosti Entomol. 57(2): 158-177.

137. Griffiths, G. C. D. 1972. The Phylogenetic classification of Diptera Cyclorrhapha. The Hague, pp. 146-147.
Abdominal structures were used in the classification of *H. i. irritans*.

138. Griffiths, R. B. 1974. Parasites and parasitic diseases. pp. 236-275. *In* Cockrill, W. R. (ed.) The Husbandry and Health of the Domestic Buffalo. FAO, Rome, 993 pp.
H. i. exigua populations on buffalo were larger than those on cattle; buffalo appeared not to suffer from feeding activity of the flies.

139. Grunberg, K. 1907. Die Blutsaugenden Dipteren. Jena, pp. 160-161.

140. Haeselbarth, E., J. Segerman, and F. Zumpt (ed.). 1966. The arthropod parasites of vertebrates in Africa south of the Sahara (Ethiopian region). Vol. III, Publ. S. Afr. Inst. Med. Res. 13(52): 35-37.

141. Haeussler, G. J. 1952. Losses caused by insects. U.S. Dep. Agric., Yearb. 1952: 144.

142. Hafez, M., and F. M. Gamal-Eddin. 1968. The feeding habits of the horn fly (*Siphona irritans*) with special reference to its biting cycle in nature in Egypt (Diptera: Muscidae). Bull. Soc. Entomol. Egypte 50(59): 41-52.

143. Hardy, D. E. 1952. Additions and corrections to Bryan's check list of the Hawaiian Diptera. Hawaii. Entomol. Soc. Proc. 14: 480-481.

144. Harley, J. M. B. 1965. Seasonal abundance and diurnal variations in activity of some *Stomoxys* and Tabanidae in Uganda. Bull. Entomol. Res. 56(2): 319-332.

145. Harris, R. L., W. F. Chamberlain, and E. D. Frazar. 1974. Horn flies and stable flies: free choice feeding of methoprene mineral blocks to cattle for control. J. Econ. Entomol. 67(3): 384-386.

With 0.94, 0.12, and 0.01 percent methoprene in mineral blocks, development of *H. i. irritans* in the field was inhibited 87 percent. Bioassay data in the laboratory indicated better than 97 percent inhibition.

146. ——— E. D. Frazar, and R. L. Younger. 1973. Horn flies, stable flies, and house flies: development in feces of bovines treated orally with juvenile hormone analogues. J. Econ. Entomol. 66(5): 1099-1102.

H. i. irritans development was inhibited in feces of cattle treated orally with 1 g/day of Hoffman-La Roche Ro7-9767 and 0.7 mg/day of Zoecon ZR-515.

147. ——— J. A. Miller, and E. D. Frazar. 1974. Horn flies and stable flies: feeding activity. Ann. Entomol. Soc. Am. 67(6): 891-894.

An electronic bitometer was used to determine the feeding activity of *H. i. irritans* feeding on a cow. Females spent an average of 163 min/day in feeding and averaged 38.4 feedings/day. Males averaged 24 feedings/day and spent an average of 96 min/day in feeding. In the laboratory female horn flies averaged 10 feedings/day and spent an average of 15.3 min/day in feeding.

148. Hasegawa, T., H. Hayakawa, and T. Chiba. 1973. Sand flies in Tohoku area, Japan. (In Japanese.) Jpn. J. Sanit. Zool. 23(4): 271.

149. Haufe, W. O. 1970. An economic evaluation of horn fly control on yearling cattle treated with DDT and coumaphos. Annu. Meeting Can. Soc. Anim. Production Proc., July 5-9, Ottawa. pp. 48-49.

150. ——— 1973a. Horn fly. Can. Agric. Insect Pest Rev. 51: 48.

151. ——— 1973b. Interaction of pesticidal toxicity, parasites, and reversible anticholinesterase activity as stresses on growth rate in cattle infested with horn flies (*Haematobia irritans*). Toxicol. Appl. Pharmacol. 25(1): 130-144.

Differential rates of gain in groups of immature cattle exposed to *H. i. irritans* attack were used to distinguish the interaction of pesticidal activity and nonpesticidal pharmacologically induced stress with host-parasite reaction.

152. ——— 1974. Haematophagus flies—a component in the impact of environment on the health and productivity of cattle. Int. Livestock Symp. Proc., Am. Soc. Agric. Engin., Ser. Publ. SP-0174. pp. 203-208.

153. Hawking, F., and M. Worms. 1961. Transmission of filaroid nematodes. Annu. Rev. Entomol. 6:415.

154. Hayes, B. W., M. J. Janes, and D. W. Beardsley. 1972. Dust bag treatments in improved pastures to control horn flies and cattle grubs. J. Econ. Entomol. 65(5): 1368-1371.

The 3-year study included various combinations of treatments of 1 and 5 percent coumaphos, 5 and 10 percent prolate, and 10 percent methoxychlor. All were effective in controlling *H. i. irritans* on Brahman-Angus or Brahman-Hereford crossbred steers.

155. Hedlund, L., L. Hahn, G. Thomas, and H. D. Johnson. 1972. Effect of flies on body movement of dairy cows. (Abstract) J. Anim. Sci. 35: 166.

156. Heimpel, A. M. 1967. A critical review of *Bacillus thuringiensis* var. *thuringiensis* Berliner and other crystalliferous bacteria. Annu. Rev. Entomol. 12: 296.

157. Henneguy, L. F. 1904. Les insectes. Paris, p. 200.

158. Hennig, W. 1952. Dipteren von den Suda-Inseln. IV. Fam. Muscidae. Beitr. Entomol. 2:93.

159. ——— 1964. Fam. 63b. Muscidae lfg. 249: 1009-1056. *In* Lindner, E. (ed.), Die Fliegen der Palaearktischen Region. Stuttgart.

160. ——— 1965. Vorarbeiten zu einem phylogenetischen system der Muscidae (Diptera: Cyclorrhapha). Stuttg. Beitr. Naturkd. 141: 76-79.

161. ——— 1968. Die Larvenformen der Dipteren. 3. Teil. Berlin pp. 365-366, 372-373.

162. Herting, B. 1957. Das weibliche postabdomen der calyptraten fliegen (Diptera) und sein merkmalswert fur die systematik der gruppe. Z. Morph. Okol. Tiere 45: 436.

163. Hinton, H. E. 1960. The chorionic plastron and its role in the eggs of the Muscinae (Diptera). Q. J. Microsc. Sci 101: 313-332.

164. Hoelscher, C. E., and R. L. Combs. 1970. The horn fly. II. Comparative physiological studies of reproductive and diapaused pupae. Physiol. Zool. 43(4): 241-248.

Respiration rate decreased threefold to fivefold when diapaused pupae were compared with reproductive specimens. Moisture content was 63.7 percent for reproductive pupae and 44.7 percent for diapaused pupae. No differences observed in lipid content in pupal samples. Glycerol was not found in reproductive pupae, but was present in diapausing pupae.

165. ——— and R. L. Combs. 1971. The horn fly. III. Sex ratio and factors affecting adult emergence. Ann. Entomol. Soc. Am. 64(4): 912-919.

A 1:1.35 male to female ratio was found from the total of 65,702 flies collected from pastured cattle during 2 years. A higher proportion of male horn flies was found in collections from the legs of calves. Temperature controlled emergence completely, but the effects of temperature were altered by photoperiod. Female flies emerged earlier than male flies in various tests. Photoperiod had the most pronounced effect on emergence when the larval and pupal stages were reared at a 12-hour reciprocal photophase of field conditions.

166. Homan, H. W., and E. P. Duren. 1975. Horn fly control on range and pastures. Idaho Univ. Coop. Ext. Serv., Current Inform. Ser. No. 282, 2 pp.

167. Hori, K. 1960. Comparative anatomy of the internal organs of the calyptrate muscoid flies. I. Male internal sexual organs of the adult flies. Sci. Rep. Kanazawa Univ. 7(1): 34.

H. i. exigua was used in the study.

168. Horne, W. T., E. O. Essig, and W. B. Herms. 1923. Plant disease and pest control. Univ. Calif. Agric. Exp. Stn. Circ. 265, p. 63.

169. Horning, B. 1959. Fliegen als ubertrager parasitarer wurmer. Z. Angew. Zool. 46: 338-342.

H. i. exigua was thought to be a vector of habronemiasis.

170. Hough, G. N. 1899. Some Muscinae of North America. Biol. Bull. (Lancaster) 1(1): 19-33.

Described differences between *H. serrata* (= *H. i. irritans*) and *H. alcis* (= *Haematobosca stimulans*).

171. ——— 1900. Notes on some European species of Calliphorinae, Muscinae Muscaeformes and Muscinae Ariciaeformes in the collection of the Hungarian National Museum. Termeszetrajzi Fuzetek. 23: 249-250.

Discussed synonomy of *H. i. irritans*.

172. Hu, Ching-fu. 1940. Catalogus insectorum sinensium. vol. 5. Peiping, pp. 341, 346-347.

173. Hukusima, S., and S. Takeda. 1973. Biological studies of horse fly and horn fly in the Iwai pasture, Gifu prefecture located at upland region and repellent tests against them. (In Japanese.) Res. Bull. Fac. Agric. Gifu Univ. 34: 71-88.

174. Huckett, H. C. 1965. Family Muscidae. pp. 869-915. *In* Stone, A., C. W. Sabrosky, W. W. Wirth, R. H. Foote, and J. R. Coulson. (ed.) A Catalog of the Diptera of America North of Mexico. U.S. Dep. Agric., Agric. Res. Serv., Agric. Handb. No. 276, 1,696 pp.

175. Ishijima, H. 1967. Revision of the third stage larvae of synanthropic flies of Japan (Diptera: Anthomyiidae, Muscidae, Calliphoridae, and Sarcophagidae). Jpn. J. Sanit. Zool. 18: 47-100.

Included descriptions of *Lyperosia exigua* (= *H. i. exigua*) and *H. sanguinolenta* (= *Haematobosca sanguinolenta*).

176. Jacobs, S. N. A. 1971. Applied ecology used against a fly pest problem in Australia. Entomol. Rec. J. Var. 83(11): 353-355.

General review of dung beetle program.

177. Janes, M. J., B. W. Hayes, and D. W. Beardsley. 1970. Dust bags control horn flies in improved pastures. Sunshine State Agric. Res. Rep. 15(2/3): 15-16.

178. Jones, B. F. 1973. Control profit-stealing horn flies. Arkansas Cattle. Bus. 9(6): 7-9.

179. ——— and G. Barnes. 1974. Protect beef cattle from external parasites. Univ. Arkansas Coop. Ext. Serv. Leafl. 285 (Rev. Annu.) 6 pp.

180. Kabos, W. J. 1951. De Diptera Brachycera van het eiland Texel, oecologisch beschouwd. Tijdschr. Entomol. 93: 127.

181. ——— 1964. Tweevleugelige insekten—Diptera. VIII. De Nederlandse vliegen (Muscidae). Wet. Meded. K.N.N.V. (K. Ned. Natuurhist. Ver.) 53: 1-32.

H. (= *Haematobosca*) *stimulans* and *Lyperosia irritans* (= *H. i. irritans*) were among species discussed.

182. ——— 1975. Two-winged insects—Diptera. Flies of the Netherlands (Muscidae). 2d amplified edition. (In Dutch.) Wet. Meded. K.N.N.V. (K. Ned. Natuurhist. Ver.) No. 110, 64 pp.

183. Kangwagye, T. N. 1973. Diurnal and nocturnal biting activity of flies: Diptera in Western Uganda. Bull. Entomol. Res. 63(1): 17-29.

Day and night catches of biting flies were made from bullock, buffalo, and at a light. Species collected were classified according to the time of day at which they bit. Flies caught in early morning included *H. minuta, H. spinigera* and *H. t. thirouxi.*

184. ——— 1974. The seasonal incidence of biting flies in Rwenzori National Park and Kigezi Game Reserve, Uganda. Bull. Entomol. Res. 63(4): 535-549.

Biting flies were collected from traps and bait animals. *H. minuta* was the only species to show a unimodal peak. This was attributed to maintenance of soil conditions suitable for the larvae during short rains (September through November). A bimodal peak was shown by *H. spinigera* (minimum numbers in the wet months—September and October).

185. Kano, R. 1954. Nippon no hae. (In Japanese.) DDT Kyokai. pp. 16, 55.

186. ——— 1959. Illustrated insect larvae of Japan. (In Japanese.) Tokyo. p. 692.

Characteristics given for identification of *H. i. exigua.*

187. ——— 1965. Iconographia insectorum Japonicorum colore naturali edita. vol. 3. (In Japanese.) Tokyo, p. 231.

188. ——— S. Shinonaga, and T. Hasegawa. 1972. On the specific name of *Haematobia* (Diptera, Muscidae) from Japan. (In Japanese.) Jpn. J. Sanit. Zool. 23(1): 49-56.

H. i. irritans and *H. i. exigua* were distinguishable; the *Haematobia* of Japan believed to be *H. i. irritans.* Characters given to separate *H. i. irritans* from *H. i. exigua.*

189. Karl, O. 1928. 13 Teil. Zweiflugler oder Diptera. III: Muscidae. *In* Dahl, F. Die Tierwelt Deutschlands und der angrenzenden Meeresteile nach ihren Merkmalen und nach ihrer Lebenweise. Jena, pp. 14-15.

190. Kellogg, V. L. 1905. American insects. New York, pp. 342-343.

191. King, H. H. 1911. Report of the entomological section of the Wellcome Tropical Research Laboratories. *In* Fourth Report of the Wellcome Tropical Research Laboratories at the Gordon Memorial College, Khartoum. Vol. B, General Science (A. Balfour, Ed.) p. 126, plate VI.

Lyperosia (= *Haematobia*) *minuta, L. thirouxi* (= *H. t. thirouxi*), and *L. exigua* (= *H. i. exigua*) were collected in Sudan.

192. Kinzer, H. G. 1971. Dust-bag and backrubber application of insecticides for control of the horn fly. Vet. Med. Rev. pp. 83-97.

193. ——— and J. M. Reeves. 1974. Dispersal and host location of the horn fly. Environ. Entomol. 3(1): 107-111.

H. i. irritans host location in relation to various environmental factors was investigated. No significant differences were shown between the success of newly emerged and day-old flies in locating hosts or between males and females of either age. In weather conditions, horn fly dispersal and subsequent host location appeared to be random with respect to predominant wind direction. Directional movements, however, were influenced by temperature, wind velocity, and humidity. There was a strong tendency for both parous and nulliparous flies to transfer from one host to another.

194. Kirkwood, A. C., and D. W. Tarry. 1973. A survey of some species of flies associated with cattle. Int. Pest Control 15(5): 6-10.

H. i. irritans was among various species of flies caught on and near a tethered calf in Surrey, England.

195. Knapp, F. W. 1972. Prevention of cattle grub infestation in lactating dairy cows by use of daily applications of crotoxyphos. J. Econ. Entomol. 65(2): 466-467.

196. ——— 1972. Evaluation of dust bags for horn fly control on cattle. J. Econ. Entomol. 65(2): 470-472.

Information on self-dusting stations and the efficacy of several different insecticides was presented. Dusts tested included 3 percent and 5 percent stirofos, 5 percent coumaphos, 3 percent malathion, 5 percent ronnel, 5 percent fenthion, and 3 percent crotoxyphos.

197. Knipling, E. F. 1959. The use of DDT in veterinary medicine. *In* S.W. Simmons (ed.). DDT, the Insecticide Dichlorodiphenyltrichloroethane and Its Significance, vol. 2, Basel, pp. 522-528.

198. ——— 1972. Integrated control of livestock insect pests. pp. 379-397. *In* Khan, M. A., and W. O. Haufe. (ed.) Toxicology, Biodegradation, and Efficacy of Livestock Pesticides. Proceedings of an Advanced Study Institute on Toxicity of Pesticides Used on Livestock Sponsored by the North Atlantic Treaty Organization and organized by the Research Station, Can. Dep. Agric. Lethbridge, Alberta. Amsterdam. 434 pp.

Discussed possibility of elimination of horn fly in North America.

199. Koe, F-H. 1975. Preliminary observation on the species constitution and the seasonal fluctuations of synanthropic flies in the plain rural region of Honan province China. (In Chinese.) Acta Entomol. Sin. 18(1): 71-76.

200. Kramer, H. 1917. Die musciden der oberlausitz. Abhandlungen Naturforschenden Gesellschaft, Gorlitz 28: 289.

201. Kramer, J. P. 1973. Susceptibility of 16 species of muscoid flies to the microsporidian parasite, *Octosporea muscaedomesticae*. J.N.Y. Entomol. Soc. 81(1): 50-53.

H. i. irritans was not susceptable to *O. muscaedomesticae*.

202. Krogerus, R. 1932. Uber die okologie und verbreitung der arthropen der triebsandegebiete an den Kusten Finnlands. Acta Zool. Fenn. 12:119.

203. Krombein, K. V., and B. D. Burks. 1967. Hymenoptera of America north of Mexico. Synoptic Catalog. U.S. Dep. Agric., Agric. Monogr. No. 2, 2d Suppl, pp. 254-255.

204. Kunz, S. E., J. R. Cunningham, and J. L. Eschle. 1973. Horn fly: use of insecticides to disrupt life cycle. J. Econ. Entomol. 66(5): 1239-1240.

Toxicant could reduce or eliminate all infestations of *H. i. irritans* if properly applied to cattle twice in 2 successive weeks. Manure pats were sampled after spraying to test effectiveness of the toxicant.

205. ——— and J. L. Eschle. 1971a. Possible use of the sterile male technique for eradication of the horn fly. International Atomic Energy Agency, Food and Agric. Organ., Int. At. Energy Proc. Ser. Sterility Principles for Insect Control or Eradication, pp. 145-156.

206. ——— and J. L. Eschle. 1971b. Use of the sterile-male technique to suppress horn flies, *Haematobia irritans* (L.). A pilot study in West Texas. Texas Conference on Insect, Plant Diseases, Weed and Brush Control Proc. 4: 128-130.

207. ——— J. L. Eschle, and J. R. Cunningham. 1975. Methods of estimating sterility in a field population of horn flies (Diptera: Muscidae). J. Med. Entomol. 12(5): 513-517.

Two methods of monitoring the effect of releasing sterile horn flies into a native population of flies were compared. The first method estimated fecundity and hatchability from horn fly eggs collected from individual manure pats. The second method estimated fecundity and hatchability from eggs collected from flies taken from cattle and held in laboratory cages.

208. ——— J. L. Eschle, and B. F. Hogan. 1973. Suppression of a horn fly population with the sterile male technique. Folia Entomol. Mexico. 25-26: 123-124.

209. ——— J. L. Eschle, and B. F. Hogan. 1976. Some bionomical aspects of horn fly populations in West Texas. Southwest. Entomol. 1: 46-48.

210. ——— M. R. Graham, B. F. Hogan, and J. L. Eschle. 1974. Effect of releases of sterile horn flies into a native population of horn flies. Environ. Entomol. 3(1): 159-162.

Low numbers of 137Cs irradiated *H. i. irritans* released into a native population had no effect despite preliminary treatments with insecticide. Larger releases caused a downward trend in reproduction and resulted in about 90 percent control during the latter part of the study.

211. ——— B. F. Hogan, R. R. Blume, and J. L. Eschle. 1972. Some bionomical aspects of horn fly populations in central Texas. Environ. Entomol. 1(5): 565-568.

Oviposition during October and November was responsible for the spring buildup of flies on cattle during April and May. The average 0.14 flies/pat that emerged from the subsequent overwintering pupae produced an F_1 generation that averaged 1.2 flies/pat. The average monthly rate of production from May to October was 6.6 horn flies/pat when competition from other arthropods was allowed, compared with 66.8/pat when competition was essentially eliminated.

212. LaChance, L. E. 1974. Status of the sterile-insect release method in the world. *In* The Sterile-Insect Technique and Its Field Applications. Proceedings of a panel on the practical use of the sterile-male technique for insect control. FAO/IAEA, Vienna, 1972. pp. 55-62.

213. Laurence, B. R. 1953. Some diptera bred from cow dung. Entomol. Mon. Mag. 89: 282.

Lyperosia (= *Haematobia*) *irritans* reared from cow dung in Harpenden, Herts, England.

214. Leese, A. S. 1909. Experiments regarding the natural transmission of surra carried out at Mohand in 1908. J. Trop. Vet. Sci. 4: 108-132.

Lyperosia (= *Haematobia*) and *Haematobia* (= *Haematobosca*) were so scarce that they were believed not to have played an important part in surra transmission.

215. ——— 1912. Biting flies and surra. J. Trop. Vet. Sci. 7: 19-34.

Lyperosia (= *Haematobia*) *minuta* was believed involved in spread of surra among camels.

216. Legner, E. F., and J. H. Poorbaugh. 1972. Biological control of vector and noxious synanthropic flies: a review. Calif. Vector Views 19(11): 81-100.

217. Leonard, M. D. 1928. A list of the insects of New York with a list of the spiders and certain allied groups. Cornell Univ. Agric. Exp. Stn. Mem. 101. p. 828.

218. Levy, R., and H. L. Cromroy. 1973. Concentration of some major and trace elements in forty-one species of adult and immature insects determined by atomic absorption spectroscopy. Ann. Entomol. Soc. Am. 66(3): 523-526.

Cu, Fe, Mg, Na, and K content of adult *H. i. irritans* was determined.

219. Lloyd, D. H., and O. O. Dipeolu. 1974. Seasonal prevalence of flies feeding on cattle in northern Nigeria. Trop. Anim. Health Prod. 6(4): 231-236. Abstr. in Rev. Appl. Entomol. 63(5): 329-330.

Two species of *Haematobia* were among insects caught in a survey of flies on cattle.

220. Lugger, O. 1897. Parasites of man and domesticated animals. Minn. Agric. Exp. Stn. Annu. Rep. (1896): 188-192.

221. Luttermoser, G. W. 1947. The use of the new insecticides in the control of extoparasites of animals. Univ. Pa. Bull. (School Vet. Med., Vet. Ext. Q. :107) 47(28): 68.

222. Ma, C. 1959. A preliminary report on the synanthropic flies of Northeastern China. (In Chinese.) Acta Entomol. Sin. 9(3): 266.

Lyperosia exigua (=*H. i. exigua*) and *L. titillans* (=*H. t. titillans*) were collected.

223. MacQueen, A. 1973. Horn fly breeding, nitrogen loss, and nutrient immobilization associated with cattle dung in the southern interior of British Columbia. Simon Fraser Univ. Ph.D. Dissertation. 213 pp.

224. ——— and B. P. Beirne. 1974. Insects and mites associated with fresh cattle dung in the southern interior of British Columbia. J. Entomol. Soc. Brit. Columbia 71: 5-9.

H. i. irritans was among the 67 insect species found to be associated with dung in B.C.

225. ——— and B. P. Beirne. 1975a. Dung burial activity and fly control potential of *Onthophagus nuchicornis* (Coleoptera: Scarabaeinae) in British Columbia. Can. Entomol. 107(11): 1215-1220.

Beetle activity in the field had little effect on the horn fly as the beetles ceased burial activity before midsummer when horn flies reached their greatest numbers.

226. ——— and B. P. Beirne. 1975b. Influence of other insects on production of horn fly, *Haematobia irritans* (Diptera: Muscidae) from cattle dung in south-central British Columbia. Can. Entomol. 107(12): 1255-1264.

Horn flies did not show a definite diurnal rhythm in oviposition. There was a single peak adult abundance during the summer. Predators *Philonthus cruentatus* Gmelin, *Sphaeridium scarabaeoides* (L.), and *S. lunatum* (F.) were chiefly responsible for horn fly suppression in B.C. Horn fly parasites and dung burying beetles were scarce.

227. Magyar, K., and G. Makara. 1974. On the possibilities of preventing the damage caused by flies in cattle. (In Hungarian.) Magy. Allatorv. Lapja 29(7): 447-448, 453-456.

228. Malviya, H. C. 1972. Stephanofilarial infection in cattle and buffalo in Anadaman Islands. Indian J. Helminthol. 24(2): 68-71.

Of the 1,002 flies collected from lesions on cattle and buffalo, 64.6 percent were *H. i. exigua*.

229. Mayer, M. S., D. L. Silhacek, D. A. Carlson, and J. D. James. 1972. Attraction of the male house fly to cuticular hydrocarbons and feces of several other dipteran species. Experientia (Basel) 28(9): 1111-1112.

Musca domestica was attracted to *H. i. irritans* cuticular hydrocarbons.

230. Mayer, R. T., and A. C. Bridges. 1975. Some effects of ionizing radiation on the lipid and glycogen content of adult horn flies, *Haematobia irritans*. Insect Biochem. 5(4): 387-398.

Measurements were made of the free sugar, glycogen, and lipid levels in flies treated with a 2.0 krad dose of ionizing radiation. Glycogen levels were depressed in males but remained unchanged in females. Triglyceride levels in both sexes were 50 percent lower than the control group, but there was no effect on the distribution of fatty acids among the various lipid classes.

231. ——— J. Cooper, F. M. Farr, and R. H. Singer. 1975. Some effects of ionizing radiation on adult horn flies, *Haematobia irritans*. Insect Biochem. 5(1): 35-42.

Adult flies were irradiated from a 137Cs source and analyzed for physiological (free) amino acids and for total (hydrolysates) amino acids. Assays showed that irradiated flies had increased levels of asparagine—glutamine and creatinine—but neither ammonia nor total amino acids were affected. Several compounds previously unreported in insects were found to occur in horn flies.

232. ——— F. M. Farr, and J. Cooper. 1975. The occurrence of creatinine and creatine phosphate in adult horn flies. J. Ga. Entomol. Soc. 10(1): 61-64.

Extracts of whole adult horn flies contained 11.0 *u*-mole creatinine and 0.5-1 *u*-mole creatine phosphate per gram tissue.

233. Maxwell, F. G. 1975. Department of entomology annual report for 1973-1974. Miss. Agric. Forest Exp. Stn., Res. Highlights 38(1): 8.

234. Maxwell-Lefroy, H. 1907. A preliminary account of the biting flies of India. Agric. Res. Inst., Pusa. Bull. No. 7: 31, 35-38.

235. ——— and F. M. Howlett. 1909. Indian insect life. Calcutta, pp. 643-647.

236. McKeown, K. C. 1944. Australian insects. Sydney, pp. 233-234.

237. Meigen, J. W. 1838. Systematische beschreibung der bekannten Europaischen zweiflugeligen insekten, vol. 7, p. 171.

238. Melville, R. V. 1974. *Siphona* Meigen, 1803, and *Haematobia* Lepeletier and Serville, 1828 (Insecta: Diptera); designations of type-species under the plenary powers. Bull. Zool. Nomencl. 30(3/4): 157-158.

Musca geniculata DeGeer, 1776 was designated type-species for *Siphona* Meigen, 1803. Designation by Westwood (1840) of *Conops irritans* Linnaeus as type-species of *Haematobia* Lepeletier and Serville, 1828 was confirmed.

239. Meng, C. H., and G. F. Winfield. 1950. Studies on the control of fecalborne diseases in North China, XVI. An approach to the quantitive study of the house-frequenting fly population. D. The breeding habits of the common North China flies. Philipp. J. Sci. 79: 165-192.

240. Merritt, R. W. 1974. The species diversity and abundance of insects inhabiting cattle droppings and their role in the degradation of dung in four different pasture and rangeland ecosystems in the Sierra Nevada foothills of California. Ph.D. Dissertation, Univ. Calif., Berkeley. 273 pp.

241. ——— 1975. Cattle dropping degradation activities by the scarab, *Aphodius fimetarius* (L.), in the Sierra foothills of California. North Cent. Branch Entomol. Soc. Am. Proc. 30: 97.

Presence of *A. fimetarius* adults in cow pats reduced the number of horn flies emerging from the droppings.

242. ——— and J. H. Poorbaugh. 1975. A laboratory collection and rearing container for insects emerging from cattle droppings. Calif. Vector Views 22(6): 43-46.

243. Messenger, P. S. 1959. Bioclimatic studies with insects. Annu. Rev. Entomol. 4: 192.

244. Miller, J. A., J. L. Eschle, and I. L. Berry. 1969. Patterns of flight activity in livestock insects. 1. Preliminary testing of a system for recording flight activity of the stable fly. Ann. Entomol. Soc. Am. 62(5): 1046-1050.

245. Miller, R. W., and L. G. Pickens. 1973. Evaluation of stirofos as a feed additive larvacide for fly control on dairy farms. (Abstr.) J. Dairy Sci. 56(5): 669.

H. i. irritans were controlled with stirofos fed to cattle at rate of 1.5 mg/kg.

246. ——— and L. G. Pickens. 1975a. Feed additives for control of flies on dairy farms. J. Med. Entomol. 12(1): 141-142.

1.5 mg stirofos per kg body wt controlled horn flies.

247. ——— and L. G. Pickens. 1975b. Evaluation of methoprene formulations for fly control. J. Econ. Entomol. 68(6): 810-812.

Neither encapsulation nor a slow release plastic formulation improved the effectiveness of methoprene tested as a feed additive for fly control. Salt blocks that contained 0.02 percent methoprene appeared to reduce horn flies on pastured dairy heifers.

248. ——— L. G. Pickens, N. O. Morgan, R. W. Thimijan, and R. L. Wilson. 1973. Effect of stable flies on feed intake and milk production of dairy cows. J. Econ. Entomol. 66(3): 711-713.

249. ——— and F. C. Uebel. 1974. Juvenile hormone mimics as feed additives for control of the face fly and house fly. J. Econ. Entomol. 67(1): 69-70.

250. Mitter, J. L. 1916. The life history of *Haematobia sanguisugens* Austen. Indian J. Med. Res. 3: 530-537, 538-540.

251. Morgan , C. E., and G. D. Thomas. 1974. Annotated bibliography of the horn fly, *Haematobia irritans* (L.), including references on the buffalo fly, *H. exigua* (de Meijere), and other species belonging to the genus *Haematobia*. U.S. Dep. Agric. Misc. Publ. 1278. 134 pp.

252. Nagasawa, S. 1959. Biological assay of insecticide residues. Annu. Rev. Entomol. 4: 334.

253. Neave, N. A. 1912. Notes on the blood-sucking insects of eastern tropical Africa. Bull. Entomol. Res. 3(3): 310, 317-318, 320, 322.

Lyperosia (= *Haematobia*) was found feeding on freshly killed animals.

254. Neilson, C. L. 1955. Handbook of the main economic insects of British Columbia. Part 2. Livestock insects. Unpubl. Mimeo. B.C. Dep. Agric., 40 pp.

255. Neveu-Lemaire, M. 1938. Traite D'Entomologie medicale et veterinaire. Paris, pp. 943-945.

256. Nevill, E. M. 1975. Preliminary report on the transmission of *Parafilaria bovicola* in South Africa. Onderstepoort J. Vet. Res. 42(1): 41-48.

257. Newton, W. H., P. J. Hamman, and M. A. Price. 1973. Suggestions for controlling external parasites of livestock and poultry. Tex. A & M Univ. Agric. Ext. Serv. MP-691, 40 pp.

258. Nuorteva, M. 1945. Observations on the life of *Oxybelus uniglumis* L. (Hym., Sphegidae). (In Finnish.) Ann. Entomol. Fenn. 11(4): 216.

H. (= *Haematobosca*) *stimulans* was preyed upon by *O. uniglumis.*

259. Oldroyd, H. 1964. The natural history of flies. London, 324 pp.

260. Osmun, J. V. 1964. Insects and other arthropods of economic importance in Indiana in 1963. Proc. Indiana Acad. Sci. 72: 146-153.

261. Painter, R. H. 1953. Horn-fly control on beef cattle in the prairie provinces. Can. Dep. Agric., Sci. Serv.-Div. Entomol. 6 pp.

262. Pal, R. and L. E. LaChance. 1974. The operational feasibility of genetic methods for control of insects of medical and veterinary importance. Annu. Rev. Entomol. 19: 269-291.

263. Papp, L. 1971. Ecological and production biological data on the significance of flies breeding in cattle droppings. Acta Zool. Acad. Sci. Hung. 17(1-2): 91-105.

264. Pate, F. M., and M. J. Janes. 1975. Use of Trolene-40 for control of horn flies and cattle grubs. Mimeo. Rep. Fla. Everglades Exp. Stn. (Belle Glade) 3: 7 pp.

265. Patnaik, B., and V. Kumar. 1972. A research note on the occurrence of juveniles of *Stephanofilaria,* the causative parasite of ear sore in buffaloes, in *Musca autumnalis.* Indian J. Anim. Sci. 42(5): 351-352.

266. Patton, W. S. 1925. Diptera of medical and veterinary importance, I. Types of older authors in continental museums. Philipp. J. Sci. 27(2): 177-200.

Synonomy of *Haematobia* was discussed.

267. ——— and E. MacGill. 1925. Comparative studies of the antennae of some of the higher Diptera. Indian J. Med. Res. 13: 284-285.

268. Peck, O. 1963. A catalogue of the Nearctic Chalcidoidea (Insecta: Hymenoptera). Can. Entomol. Suppl. 30. 1,092 pp.

Included various parasitic chalcids of *H. i. irritans.*

269. ——— 1974. Chalcidoid parasites of the horn fly, *Haematobia irritans* (Diptera: Muscidae), in Alberta and elsewhere in Canada. Can. Entomol. 106(5): 473-477.

Horn fly was parasitized by *Muscidifurax raptor, M. zaraptor, Eupteromalus viridescens, Spalangia drosophilae, S. subpunctata,* and *S. e. erythromera. Spalangia* spp. was credited with parasitizing up to 40 percent of horn fly pupae in traps, and *Muscidifurax* spp. up to 30 percent.

270. Peris, S. V. 1951. Los Stomoxydinae de la Peninsula Iberica (Dipt., Muscidae). Rev. Acad. Cienc. Exactas Fis-Quim. Nat. Zaragoza 6: 41-49.
Discussed the classification of Spanish stomoxyine flies.

271. ——— 1960. Notas Dipterologicas. Graellsia 18: 59-63.
Discussed stomoxyine flies found in Spain.

272. Peterson, A. 1960. Larvae of insects. Part II. Ann Arbor, pp. D27, 260, 316.
Identification of horn fly larvae is presented.

273. Pickens, L. G., and R. W. Miller. 1975. Growth-regulating chemicals tested against nontarget insect fauna in bovine fecal pats. Environ. Entomol. 4(1): 46.

274. Pont, A. C. 1970. The type material of Oriental and Australasian Muscidae (Diptera) in the Zoological Museum, Amsterdam. Beaufortia 18(231): 86.
H. i. exigua lectotype, paralectotype, and seven syntypes were present in the collection.

275. ——— 1973a. Muscidae (house-flies, stable-flies etc.). *In* Smith, G. V. (ed.). Insects and Other Arthropods of Medical Importance. Brit. Museum (Nat. Hist.) London, pp. 251-269, 489.

276. ——— 1973b. Studies on Australian Muscidae (Diptera). IV. A revision of the subfamilies Muscinae and Stomoxyinae. Aust. J. Zool. Suppl. Ser. 21: 129-296.
H. exigua was regarded as a subspecies of *H. irritans* in accordance with Zumpt (1973).

277. Popham, W. L., and D. G. Hall. 1958. Insect iradication programs. Annu. Rev. Entomol. 3: 336.

278. Povolny, D. 1959. Gesichtpunkte der klassifikation von synanthropen fliegen. Z. Angew. Zool. 46: 324-328.

279. Rack, G. 1975. Two new species of the genus *Pediculaster* from Australian Diptera. (In German.) Acarologia (Paris) 16(3): 500-505.
P. domrowi sp. n. and *P. morelliae* sp. n. were found attached at the halteres, thorax, and abdomen of *H. i. exigua* and *Morellia hortensia.*

280. Railliet, A. 1886. Elements de Zoologie Medical et Agricole. Paris, p. 548.

281. Ransom, B. H. 1908. The animal parasites of cattle. U.S. Dep. Agric., Bureau of Animal Industry. Special Rep. on Diseases of Cattle. pp. 496-497.

282. Reid, E. T. M. 1956. Notes on the distribution of Stomoxydinae (Dipt., Muscidae) in the Southern Sudan. Entomol. Mon. Mag. 92: 343-346.

283. Reinhardt, R. 1975. Shoo fly. Zoecon Corp. (Palo Alto, Calif.) Annu. Rep. for year ended December 31, 1974, pp. 5-10.
Discussed possible control of horn fly with growth regulator methoprene.

284. Riedel, M. P. 1919. Beitrag zur kenntnis der dipterenfauna des Niederrheins. Entomol. Zeitschr. Frankfurt, 33: 39.

285. Ringdahl, O. 1921. De skanska stranddynernas insektfauna. Entomol. Tidskr. 41: 39.

286. ——— 1926a. Neue nordische musciden nebst berichtigung und namensanderungen. Entomol. Tidskr. 47: 101.

287. ——— 1926b. Musciden und Anthomyiiden von estlandischen hochmooren und nachtrag zu den Tachiniden. *In* Dampf, A. Zur Kenntnis der estlandischen Hochmoorfauna. Sitzungberichte der Naturforscher-Gesellschaft bei der Universitat Tartu 33: 86.

288. ——— 1928. Beitrage zur kenntnis der Anthomyidenfauna des nordlichen Norwegens. Tromso Museums Arshefter 49(3): 10.

289. ——— 1945. Oversikt av smaslaktena inom familjen Muscidae. Entomol. Tidskr. 66: 95-106.

290. ——— 1951. Flugor fran fjalltrakterna. Opusc. Entomol. 16: 171.

291. ——— 1952. Catalogus insectorum Sueciae. Diptera, Cyclorrapha: Muscaria, Schizometopa. Opusc. Entomol. 17: 150.

292. ——— 1959. Flugor pa strandangar i nordvastra skane. Entomol. Tidskr. 80: 44.

293. ——— 1960. Flugfaunan pa kullaberg och hallands vadero. Kullabergs Natur 2: 24.

294. Rivosecchi, L. 1953a. Contributo alla conoscenza delle Stomoxydinae Italiane (Diptera: Muscidae). Riv. Parassitol. 14: 29-36.

295. ——— 1953b. I Muscidae pungenti (Diptera, Stomoxydinae) Italiani. Rend. Inst. Super. Sanita 16: 286-332.
Morphological and ethological aspects of five species of Stomoxyine flies were studied.

296. ——— and E. Stella. 1974. Bloodsucking arthropods from nature reserve areas. Part 1. The Circeo National Park, Italy. (In Italian.) Parassitologia. Rome, 15(3): 281-296.

297. Roark, R. C., and N. E. McIndoo. 1944. A digest of the literature on DDT through April 30, 1944. U.S. Dep. Agric., Entomol. and Plant Quarantine. E-631. pp. 43-44.

298. Roberts, J. E. 1969. Horn fly control. Arkansas Cattle Bus. 5(7): 8.

299. Roberts, R. H. 1972a. Horn fly control with insecticides applied with photo-actuated sprayers. Miss. Agric. Exp. Stn. Inform. Sheet 1181, 2 pp.

300. ——— 1972b. Sprayer control of horn flies. Miss. Farm. Res. 35(3): 4-6.

301. ——— and R. A. Hoffman. 1970. Horn flies on cattle controlled with several insecticides applied with a power spray. Miss. Agric. Exp. Stn. Inform. Sheet 1112, 2 pp.

302. ——— and W. A. Pund. 1974. Control of biting flies on beef steers: effect on performance in pasture and feedlot. J. Econ. Entomol. 67(2): 232-234.

Steers from insecticide treated groups averaged higher daily gains and required less feed per pound of gain than steers from the control groups, but the differences were not significant.

303. Rodriguez, J. G., J. Singh, and B. Taylor. 1970. Manure mites and their role in fly control. J. Med. Entomol. 7: 335-341.

304. Ronald, N. C., and C. W. Wingo. 1973. Cost and effectiveness of horn fly and face fly control programs in semi-isolated range herds in central Missouri. J. Econ. Entomol. 66(3): 693-696.

Standard control programs and a ronnel-supplement program were used under large herd-large pasture conditions. Only sprays produced satisfactory control of *H. i. irritans* without supplementary control measures.

305. Roselle, R. E. 1956. Control livestock insects. Univ. Nebr. Ext. Circ. 56-1575, 2 pp.

306. ——— and J. B. Campbell. 1970. Horn flies on range cattle. Nebr. Cattleman 26(9): 36.

307. Roubaud, E. 1906. Stomoxides nouveaux du Senegal. Cent. Rech. Seances Soc. Biol. 60: 895-897.

308. ——— 1907. Stomoxides nouveaux du Congo. Ann. Inst. Pasteur (Paris) 21: 666-669.

309. Ruzimuradov, A. 1972. Protective action of Co-Ral and Dibrom against pasture flies. (In Russian.) Tr. Uzb. Nauchno-Issled. Inst. Vet. 20: 135-136.

310. ——— 1974. Flies, parasites of skin integument of domestic animals. (In Russian.) Parazitologiya (Leningr.) 8(5): 447-448.

311. ——— and T. Pirnazarov. 1972. Flies of farm stock in the Kashkadar' Insoki regions. (In Russian.) Tr. Uzb. Nauchno-Issled. Inst. Vet. 20: 137.

312. Sabrosky, C. W. 1971. The type-species of *Siphona* Meigen, 1803, and *Haematobia* Lepeletier and Serville, 1828 (Insecta: Diptera) Z.N. (S.) 195. Bull. Zool. Nomencl. 27(5-6): 234-237.

313. Sanchez, S. A. 1973. Dung beetles. Cattleman 59(10): 76-77.

314. Savio, T., L. Hahn, H. D. Johnson, and G. D. Thomas. 1972. Effect of horn flies on 3-methoxy-4-hydroxy mandelic acid excretion in cattle. J. Dairy Sci. 55(5): 700. (Abstract only).

Increased excretion of vanilmandelic acid believed to result from increase in standing time and nervous activity associated with the physical disturbance caused by the biting of the flies.

315. Savio, T. J., H. D. Johnson, L. Hahn, and G. D. Thomas. 1976. Effect of horn flies on vanilmandelic acid execretion of dairy cattle. J. Dairy Sci. 59(2): 318-320.

Increased vanilmandelic acid excretion in urine reflected an increase in standing time and nervous activity associated with the physical disturbance caused by the biting activity of the flies. Study was conducted on six lactating Holstein cows exposed to approximately 500 horn flies per cow per day for 4 weeks.

316. Schlinke, J. C., and J. S. Palmer. 1973. Combined effects of phenothiazine and organophosphate insecticides in cattle. J. Am. Vet. Med. Assoc. 163(7. pt. 1): 756-758.

At recommended dosages, no potentiation of the toxic effect of any of the insecticides by phenothiazine existed.

317. Schmidt, C. D. 1972. Classification of the physiological development of laboratory-reared female horn flies, *Haematobia irritans*. Ann. Entomol. Soc. Am. 65(3): 695-701.

The following characteristics were used to classify physiological age or development: presence of sperm in spermathecae, presence of follicular relics, pattern of tracheoles on ovarioles, contents of malpighian tubes, appearance of fat bodies, and numbers of nonfunctional ovarioles.

318. ——— and R. R. Blume. 1973. Laboratory-reared horn flies: relationships between width of head and weight of pupa in both sexes and between these measurements and number of ovarioles in females. Ann. Entomol. Soc. Am. 66(6): 1307-1308.

Head width at the widest point was significantly correlated with the weight of 6-day-old pupae. The average number of ovarioles/female was correlated with the average weight of the pupa and the average width of the head.

319. ——— J. L. Eschle, S. E. Kunz, and J. M. Dreiss. 1974. Sterile-male technique for suppression of the horn fly: effects of irradiation, handling, and release on laboratory-reared flies. Environ. Entomol. 3(2): 287-289.

Emergence of adults was reduced slightly by irradiation and significantly by shipment and release. Refrigeration to delay emergence of adults reduced percentage emergence.

320. ——— C. R. Ward, and J. L. Eschle. 1973. Rearing and biology of the horn fly in the laboratory: effects of density on survival and fecundity of adults. Environ. Entomol. 2(2): 223-224.

When 100 adult flies were placed in cages of 7 sizes or various numbers of flies were placed in 237-cm^3 cages, the hatchability of the eggs obtained from the more densely populated cages was always higher. Survival of flies was higher when the cages were less densely populated. Densities of caged flies ranging from 0.6 to 9.5 cm^3 of space/fly were recommended for rearing laboratory flies.

321. Schmidt, F. M. 1971. Ranchers adopt aerial spraying for flies. Serving Farm, Ranch, Home. Univ. Nebr. Coll. Agric. Home Econ. Q. 18(2): 15-16.

322. Schnabl, J. 1911. Dipterologische sammelreise nach Korsika. Dtsch. Entmol. Z. p. 97.

323. Schumann, H. 1961. Die eier von fliegen. Mikrokosmos 50: 297-300.

324. ——— 1963. Zur larvalsystematik der Muscinae nebst beschreibung einiger musciden und anthomyidenlarven. Dtsch. Entomol. Z. 10: 134-163.

Discussed larval stages of various muscine flies including *H. i. irritans* and *H. t. titillans*. Includes key for separating third stage muscid larvae and illustrations of cephalopharyngeal skeletons and spiracular plates for various species of muscids.

325. Schwartz, B., R. E. Rebrassier, J. E. Ackert, and others. 1947. Report of the committee on parasitic diseases. U.S. Livestock Sanit. Assoc. Rep. 50: 98.

326. Schwarz, M., R. W. Miller, J. E. Wright, and others. 1974. Compounds related to juvenile hormone. Exceptional activity of arylterpenoid compounds in four species of flies. J. Econ. Entomol. 67(5): 598-601.

The six compounds tested were highly active against all four species of flies including the horn fly.

327. Scott, H. G., and K. S. Littig. 1962. Flies of public health importance and their control. Insect Control Series: Part 5. U.S. Dep. Health Educ. Welfare, Public Health Serv. Publ. No. 772, 40 pp.

328. Seguy, E. 1924. Les insectes parasites de l'homme et des animaux domestiques. Encyclopedie Pratique du Naturaliste. Paris, pp. 276-280.

329. ——— 1933. Contributions a l'etude de la faune du Mozambique. Voyage de M. P. Lesne (1928-1929). Memorias e estudos do Museu Zoologico da Universidade de Coimbra. Serie 1. No. 67. p. 54.

330. ——— 1934. Dipteres (Brachyceres) (Muscidae Acalypterae et Scatophagidae). Faune Fr. 28: 25.

331. ——— 1937. Diptera. fam. Muscidae. fasc. 205. *In* Wytsman, P. (ed.) Genera Insectorum. Bruxelles. 604 pp.
Discussed synonomy, types, and geographical distribution of *Haematobia* and other stomoxyine flies.

332. ——— 1951. Ordre des Dipteres. *In* Traite de Zoologie. Anatomie, Systematique, Biologie. Tome 10. Insectes Superieures et Hemipteroides (Premier Fascicule). Paris, pp. 721-722.

333. ——— 1957. Anthophilie des dipteres haematophages. Rev. Fr. Entomol. 24: 390.

334. Sen, S. K., and T. B. Fletcher. 1962. Veterinary entomology and acarology for India. New Delhi, 668 pp.

335. Senior-White, R. 1922. Notes on Indian Diptera. Mem. Dep. Agric. India. Entomol. Ser. 7(9): 99.

336. Shinonaga, S., and R. Kano. 1971. Fauna Japonica, Muscidae I (Insecta: Diptera). Tokyo, pp. 87-90.
Discussed taxonomy and geographical distribution of *H. i irritans* and *H. i. exigua* in Japan.

337. Shol', V. A. 1969. Description of the causative organism of setariosis in marals. (In Russian.) Izv. Akad. Nauk Kaz. SSR Ser. Biol. 6:45-50.

338. ——— and N. I. Drobishchenko. 1971. Development of the causative agent of setariosis of marals in the body of the blood-sucking fly, *Haematobia stimulans*. (In Russian.) Dokl. Akad. Nauk SSSR Ser. Biol. 199 No. 2, pp. 503-504.

339. Shull, W. E., and R. A. Fisher. 1940. Recommendations for insect control. Idaho Ext. Bull. No. 129, p. 31.

340. Simpson, J. J. 1911. Entomological research in British West Africa. I. Gambia. Bull. Entomol. Res. 2: 187-239.

341. Singh, A., and R. C. Chhabra. 1973. Incidence of arthropod pests of domesticated animals and birds. Indian J. Anim. Sci. 43(5): 393-397.

342. Smart, J. 1948. A handbook for the identification of insects of medical importance. Brit. Museum (Nat. Hist.) London, pp. 61-62.

343. Smith, J. B. 1900. Insects of New Jersey. Suppl. 27th Annu. Rep. N.J. State Board of Agric., pp. 559, 678-679.
Spalangia haematobiae was listed as a parasite of the horn fly.

344. Snyder, F. M. 1965. Insects of Micronesia, Diptera: Muscidae. Insects Micronesia 13(6): 311-313.
H. i. exigua was found on islands of S. Mariana, Palau, Yap, and Ponape.

345. Spackman, E. W., and J. E. Lloyd. 1975. Control insect pests of beef cattle, 1975. Wyo. Agri. Exp. Stn. Bull. 544 R. 20 pp. (Rev. Annu.)

346. Staal, G. B. 1975. Insect growth regulators with juvenile hormone activity. Annu. Rev. Entomol. 20: 427.

347. Standfast, H. A., and A. L. Dyce. 1972. Arthropods biting cattle during an epizootic of ephemeral fever in 1968. Aust. Vet. J. 48(3): 77-80.

348. Steelman, C. D. 1976. Effects of external and internal arthropod parasites on domestic livestock production. Annu. Rev. Entomol. 21: 155-178.

349. ——— T. W. White, and P. E. Schilling. 1972. Effects of mosquitoes on the average daily gain of feedlot steers in Southern Louisiana. J. Econ. Entomol. 65(2): 462-466.

350. Stoffolano, J. G. 1970. Nematodes associated with the genus *Musca* (Diptera: Muscidae). Bull. Entomol. Soc. Am. 16(4): 194-203.

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